market value of $25 million and its equity has a market value of $75 million, then its total market capitalization is $100 million, and its capital structure contains 25 percent debt and 75 percent equity.

Q. Why do economists measure a firm's capital structure in terms of the market values of its debt and equity?

A. Economists measure a firm's capital structure in terms of the market values of its debt and equity because that is the best measure of the amounts of debt and equity that investors have invested in the company on a going-forward basis. Furthermore, economists generally assume that the goal of management is to maximize the value of the firm, where the value of the firm is the sum of the market value of the firm's debt and equity. Only by measuring a firm's capital structure in terms of market values can its managers choose a financing strategy that maximizes the value of the firm.

Q. Is the economic definition of the cost of capital, which focuses on the market values of debt and equity, widely accepted by capital market participants?

A. Yes. Homeowners measure the value of their homes in terms of market values, not historical cost or book values. Investors measure the return and risk on their portfolios in terms of market values, not

book values. Companies use a market value definition of the cost of capital to make entry, investment, and innovation decisions.

Q. How do investors measure the rate of return on their investment portfolios?

A. Investors, like economists, measure the rate of return on their investment portfolios in terms of the market values of the debt and equity in their portfolios. Suppose an investor has a portfolio that has a market value of $100,000 at the beginning of 2000. Further suppose that the value of the portfolio at the end of 2000 is $112,000, and that the investor earns interest and dividends of $3,000 during the course of 2000. Then the investor's rate of return in 2000 is 15 percent [(112 – 100)/100 + 3/100 = 15 percent]. In making this calculation, I assumed that dividends and interest were not reinvested in the portfolio during the year.

Q. Suppose the investor in your previous example purchased his portfolio in 1980 at a cost of $20,000. Does the historical cost of investment in 1980 have any effect on either the investor's earned or required rate of return in 2000?

A. No. The fact that the investor purchased the portfolio in 1980 for $20,000 has no bearing on either the investor's earned or required rate of return in 2000. Thus, the historical or embedded cost of the

investment is irrelevant to the calculation of the rate of return. Investors calculate their rate of return based on market values, not book values.

Q. Your example clearly demonstrates that the investor's earned rate of return in 2000 depends on the $100,000 market value of the portfolio at the beginning of 2000, not on the $20,000 historical cost, or book value, of the portfolio in 1980. Do investors measure the *required* rate of return for 2001 in terms of the market value or the book value of their portfolio at the beginning of 2001?

A. Investors measure their required rate of return for 2001 in terms of market values, not book values. Suppose that the investor's required rate of return for 2001 is 15 percent. Since the value of the portfolio at the beginning of 2001 is $112,000, the investor will require a dollar return of $16,800 in 2001 (15 percent x $112,000 = $16,800) including dividends, interest, and capital gains. If the investor expects a return less than $16,800, he should sell this portfolio and invest his capital in another portfolio that has an expected rate of return of at least 15 percent.

Q. If a group of investors were to construct a portfolio that consisted of all of a firm's debt and equity, how would they measure the required return on their investment?

A. These investors would measure their required return by calculating a weighted average of their required returns on the debt and equity portions of the portfolio, where the weights are measured in terms of market values, not book values. For example, if a firm's debt has a market value of $25 million, its equity has a market value of $75 million, the market interest rate on corporate debt of similar risk is 9 percent, and the market required return on equity of similar risk is 15 percent, then the required rate of return on a $100 million portfolio containing all of the firm's debt and equity securities would be 13.5 percent (.25 x 9 percent + .75 x 15 percent = 13.5 percent).

Thus, the investors' required rate of return from an investment in the company is the same as the company's weighted average cost of capital, where both the required rate of return and the weighted average cost of capital are measured in terms of market value weights.

Q. Is the economic definition of the average cost of capital consistent with the way competitive firms determine the required rate of return on investment decisions?

A. Yes. Managers also use a market value definition of the weighted average cost of capital in making investment decisions. From the manager's perspective, the firm's cost of capital is equal to the return investors can earn on the market value of other investments of the

same risk. Rational managers, like rational investors, will not commit resources to investments in new markets or technologies unless the expected return on the market value of these investments in new markets or technologies is greater than or equal to the firm's cost of capital, measured on a market value basis, for projects with the same degree of risk.

Q. Does the economic logic behind the definition of the cost of capital have any implications for competitive entry in the local exchange market in Massachusetts?

A. Yes. If the Department wants to encourage facilities-based competitive entry in the market for local exchange services, the cost of capital input in Verizon MA's forward-looking cost studies must be at least as large as the return those potential facilities-based competitors can earn on other investments of the same risk. If potential competitors can lease local exchange facilities from Verizon MA at rates that include a ten percent rate of return on investment, for example, they will have no incentive to invest in their own facilities if they can earn returns greater than ten percent on other investments of comparable risk. In short, it would make more sense for those competitors to lease the undervalued unbundled network elements from Verizon MA than to build their own facilities. To provide correct

incentives for entry into local exchange markets, the Department must measure Verizon MA's cost of capital in the same way that potential competitors measure their own costs of capital.

Q. Does the economic definition of the cost of capital have any implications for the policy goal of encouraging investment and innovation in telecommunications services?

A. Yes. The Department must likewise use a market definition of the cost of capital if it wishes to promote investment and innovation in telecommunications services. In competitive markets, the incumbent and its competitors can be encouraged to invest in new technologies, products, and services only if the rate of return they can earn on the market value of their investments exceeds the rate of return they could earn on the market value of other investments of the same risk.

Q. Does the required rate of return on an investment vary with the risk of that investment?

A. Yes. Since investors are averse to risk, they require a higher rate of return on investments with greater risk.

Q. Do economists and investors consider future industry changes when they estimate the risk of a particular investment?

A. Yes. Economists and investors consider all the risks that a firm might incur over the future life of the company.

Q. Do investors also use market value weights to measure the risk of their investment portfolios?

A. Yes. One measure of investment risk is a company's beta, which measures the company's stock price volatility relative to the volatility of the market. Using the previous example, where the firm's debt has a market value of $25 million and its equity a market value of $75 million, if the firm's debt has a beta of .5 and its equity a beta of 1.2, then the beta on a $100 million portfolio containing all of the firm's debt and equity would be 1.025 (.25 x .5 + .75 x 1.2 = 1.025).

Q. Why do investors measure the risk and return on their investment portfolios using market value weights rather than book value weights?

A. Investors measure the risk and return on their investment portfolios using market value weights because market value weights are the best measure of the amounts the investors currently have invested in each security in the portfolio. From the investor's point of view, the historical cost or book value of his investment is entirely irrelevant to the current risk and return on his portfolio. Thus, the return, and the risk or uncertainty of the return, can be measured only in terms of market values.

Q. Is the economic definition of the average cost of capital consistent with regulators' traditional definition of the average cost of capital?

A. No. As noted above, the economic definition of the average cost of capital is based on the market costs of debt and equity, the market value percentages of debt and equity in a company's capital structure, and the future expected risk of investing in the company. Regulators, in contrast, have traditionally defined the average cost of capital using the embedded cost of debt, the book values of debt and equity in a company's capital structure, and the risk of investing in a franchised provider of telecommunications services.

Q. What is the difference between the market cost of debt and a company's embedded cost of debt?

A. The market cost of debt is the rate of interest a company would have to pay if it issued debt under today's market conditions. The embedded cost of debt is the company's total interest expense divided by the total book value of its debt. Thus, the embedded cost of debt is an average of the interest rates the company has paid in the past to issue debt securities. This calculation of the embedded cost of debt, however, provides no basis for measuring the market cost of debt.

Q. What is the difference between the market value and the book value of a company's debt?

A. The market value of a company's debt represents the current price in the capital markets of the company's debt obligations. The book value

of a company's debt is the historical face value of its debt adjusted for the accounting amortization of premiums and discounts. The market value of a company's debt is approximately equal to the book value of its debt when market interest rates are approximately equal to the average interest rate of the company's previous debt issuances.

Q. What is the difference between the market value and the book value of a company's equity?

A. The market value of a company's equity is simply the market price of the company's stock times the number of shares outstanding. The book value of equity is more complex; it represents the sum of paid-in capital and retained earnings, where paid-in capital represents the amount of capital a firm has historically obtained from stock issuances, and retained earnings represent the cumulative earnings over the life of the company that have not been paid out as dividends. In addition, the book value of a company's equity is adjusted periodically for accounting events such as changes in accounting rules and regulations, write-offs, and extraordinary events.

Q. Does the book value of a company's equity reflect the historical cost of its assets?

A. Yes. The book value of a company's equity is defined as the book value of a company's assets minus the book value of the company's debt:

Book Value of Equity = Book Value of Assets - Book Value of Debt

Since the book value of a company's assets, in turn, is equal to the historical cost of a company's assets minus accumulated depreciation, the book value of a company's equity can also be stated as the historical cost of a company's assets, minus the accumulated book depreciation on these assets, minus the book value of a company's debt:

Book Value of Equity = Historical Cost of Assets – Accumulated Book Depreciation – Book Value of Debt

Thus, the book value of a company's equity reflects the historical cost of the company's assets.

Q. Why have state and federal regulators defined the average cost of capital in terms of embedded costs and book values rather than forward-looking costs and market values?

A. State and federal regulators traditionally have defined a company's average cost of capital in terms of embedded costs and book values because these concepts were consistent with the regulators' accounting model of the firm. Economists, in contrast, generally

employ an economic model of the firm in which forward-looking costs and market values are the relevant standards.

Q. Is the traditional state and federal regulatory definition of the average cost of capital consistent with the economic principles underlying a forward-looking cost study?

A. No. As I have already noted, the economic principles underlying a forward-looking economic cost study require that the average cost of capital be calculated using a market interest rate, a market value capital structure, and a cost of equity that measures the return investors require in competitive markets on other investments of the same risk. In contrast, the regulatory definition of the weighted average cost of capital is based on an embedded interest rate, a book value capital structure, and a cost of equity that measures the return investors require in markets that are at least partially protected from competition. The regulatory definition of the weighted average cost of capital is inconsistent with the economic principle that economic costs are forward looking and market based, not backward looking and accounting based.

Q. In its 271 Order, the FCC expressed a concern that in setting UNE rates, the Massachusetts Department used a cost of capital that was higher than it used in setting local rates. The FCC called that

12.16 percent cost of capital "relatively high," and questioned whether it was justified. [271 Order at ¶ 38.] Is it reasonable for the cost of capital input in Verizon MA's UNE cost studies to exceed the last authorized rate of return for Verizon MA's regulated operations?

A. Yes. Recall that Verizon MA's retail rates under rate of return regulation were based on historical cost, rather than forward-looking economic cost. Thus, the cost of capital input under traditional rate of return regulation was based on a book value capital structure that reflected the historical cost of Verizon MA's assets, an embedded cost of debt, and a cost of equity appropriate to a regulated company serving a franchised area prior to the passage of the Telecommunications Act of 1996.

In contrast, the FCC has clearly stated that the cost of capital input in UNE cost studies must be based on the principle of forward-looking economic costs because forward-looking economic costs replicate conditions in a competitive marketplace. Unlike the historically-oriented cost of capital used in traditional rate of return regulation, the forward-looking economic cost of capital must necessarily be based on the market values of debt and equity in the company's capital structure, the market cost of debt, and the cost of equity for a company operating in a competitive marketplace.

Given the significant differences between historical-cost ratemaking principles and forward-looking economic cost ratemaking principles, it is not surprising that the forward-looking economic cost of capital can be significantly higher than the traditional regulated rate of return cost of capital. Indeed, the appropriate cost of capital input in Verizon MA's previous UNE cost studies exceeded the last authorized rate of return because: (1) Verizon's market value capital structure contained less debt and more equity than the historical cost, book value capital structure used under rate of return regulation; (2) the market cost of debt exceeded the embedded cost of debt used in the last rate of return proceeding; and (3) the cost of equity for a company operating in a competitive marketplace exceeded the cost of equity for a company operating in a franchised marketplace.

Q. In the 271 Order, the FCC also notes that "AT&T questions whether there is any reason to believe that offering UNEs on a wholesale basis, where Verizon faces no competition, is riskier than offering retail service, where it now has competition." [271 Order at ¶ 38.] Is there any basis for AT&T's argument that the cost of capital used in setting UNE rates should be lower than the cost of capital used in setting retail rates on the theory that the risk is lower in providing unbundled network elements?

Q. No. First, AT&T's argument is based on a false premise. As I explain in Section III, the risk of providing unbundled network elements is greater than the risk of providing local exchange service.

Second, and more importantly, AT&T's argument is intellectually dishonest. The Department is trying to determine the cost of capital to be used in forward-looking cost studies that, according to the FCC, will produce UNE rates that replicate the costs competitors would face "in a fully competitive market." [271 Order at ¶ 42.] It is wrong, therefore, to suggest that capital costs should reflect a market where, in AT&T's words, "Verizon faces no competition." There is simply no basis for AT&T's attempt to pick and choose which forward-looking costs should reflect a competitive market and which should not. To be consistent in determining the inputs to the forward-looking cost studies, the cost of capital **must** also reflect a fully competitive market.

Q. In sum, then, what is the proper definition of the average cost of capital for use in the Verizon MA's forward-looking cost studies?

A. The Telecommunications Act of 1996 removes all barriers to entry in the local exchange market and opens the market to full competition. In a competitive market for local exchange service, forward-looking economic cost is the appropriate cost benchmark for forward-looking

cost studies. Furthermore, the forward-looking economic cost of capital is based on market values rather than book values. Thus, for use in Verizon MA's forward-looking economic cost studies, the average cost of capital should be defined in terms of market interest rates, the market values of debt and equity in a company's capital structure, and investors' expectations regarding the future risk of investing in the company in a competitive environment. This is the only definition of the average cost of capital that is consistent with the underlying assumptions of Verizon MA's forward-looking cost studies.

III. RISK

Q. You have stated that the cost of capital depends on investment risk. Have you studied the risk of investing in the facilities required to provide local exchange service in Massachusetts?

A. Yes, I have.

Q. What are the major factors that affect the risk of investing in the facilities required to provide local exchange service in Massachusetts?

A. The risk of investing in the facilities required to provide local exchange service in Massachusetts depends on operating leverage, the level of competition, rapidly changing technology, and the regulatory environment.

Q. What is operating leverage?

A. Operating leverage refers to the relationship between the company's revenues, on the one hand, and the company's fixed and variable costs on the other. The provision of facilities-based telecommunications services is a business that requires a large commitment to fixed costs in relation to variable costs, a situation called high operating leverage. The relatively high degree of fixed costs in the provision of facilities-based telecommunications service exists because of the average LEC's large investment in fixed assets such as central office, transport, and loop facilities. High operating leverage causes Verizon MA's net income to be highly sensitive to fluctuations in revenues. There is a positive correlation between operating leverage and risk: as operating leverage rises, so does the risk of operation.

Q. What is the current status of local exchange competition in Massachusetts?

A. Local exchange competition is extensive throughout Massachusetts. In its 271 filing before the FCC, as presented in the Declaration of Dr. William E. Taylor, Verizon MA presented evidence that:

- Over 200 CLECs are authorized to provide local exchange service.
- Verizon MA has signed, and the Department has approved, 70 interconnection agreements with facilities-based CLECs since 1996.

- Competitors have deployed over 2,175 route miles of fiber and at least 22 local switches in Verizon MA's service territory in Massachusetts.

- Competitors have obtained at least 1,600 collocation arrangements throughout the state.

- Competitors have access to 95 percent of the access lines served by Verizon MA in Massachusetts.

- Verizon MA has provided 1,400 NXX codes representing 14,000,000 numbers to 38 different competitors.

- Competitors serve at least 676,000 lines in Massachusetts—418,000 lines over their own facilities, 11,800 through unbundled network elements, and 246,00 through resale.

Verizon MA's 271 filing was based on data collected in July 2000. Since that time, the level of local competition in Massachusetts has continued to grow.

Q. Who are Verizon MA's major local exchange competitors in Massachusetts?

A. Among the competitors with the facilities required to offer local exchange service in Massachusetts are AT&T, WorldCom, Sprint, RCN, Allegiance Communications, Network Plus Corp, ChoiceOne Communications, Global Crossing, PaeTec Communications, Inc., Teligent, Winstar, and XO Massachusetts.

Q. What are AT&T's current strategies for providing local exchange service in Massachusetts?

A. AT&T has at least five current strategies for providing local exchange service in Massachusetts. First, AT&T currently provides local exchange service through its own wireline local exchange facilities. (Many of these facilities were acquired through AT&T's purchase of TCG, which had previously acquired Massachusetts facilities-based competitor ACC.) In Massachusetts, AT&T currently operates a local exchange network with four local exchange switches and more than 450 route miles of fiber connected to over 211 buildings.

Second, AT&T either provides or intends to provide local exchange service over its own cable networks and the cable networks of other companies with whom it has agreements. AT&T currently has an ownership interest in cable systems that serve 2.1 million subscribers in the greater Boston area, and pass more than 80 percent of all Massachusetts households.

Third, AT&T provides or intends to provide local exchange service over its fixed and mobile wireless facilities in Massachusetts. With regard to mobile wireless services, AT&T offers its Digital One Rate, which, by eliminating all roaming and long distance charges, makes AT&T's mobile wireless services competitive with landline service for many customers.

Fourth, AT&T provides local exchange service through its own long distance facilities in Massachusetts. Its Digital Link service connects customers to AT&T's toll switches via high capacity trunks. Both inbound and outbound local calling are part of the Digital Link service.

Finally, AT&T can provide local exchange service to residential and other customers either by reselling Verizon MA's local exchange service or by leasing Verizon MA's unbundled network elements. In this way, AT&T can provide local exchange service without investing the large amount of capital required to provide service.

Q. Does AT&T have any advantages in offering local exchange services in Massachusetts?

A. Yes. AT&T has several major advantages in offering local exchange services in Massachusetts compared to Verizon MA. First, AT&T is the leading provider of long distance service in both Massachusetts and the nation. Since most customers spend more on long distance than on local exchange service, they may prefer to shift their local services to their long distance provider than to shift their long distance service to their local provider.

Second, AT&T has the most highly recognized national brand name in the industry. Thus, Verizon MA's customers already

recognize AT&T as a highly capable provider of telecommunications services.

Third, AT&T can provide a complete bundle of local, long distance, wireless, video, Internet, and data services, while Verizon MA cannot provide video services at this time and must provide data services through a separate subsidiary. AT&T's ability to provide a complete bundle of these services gives it the opportunity to offer package discounts that competitors will find difficult to match.

Fourth, many Massachusetts business customers prefer to obtain their telecommunications services from a company that can provide service to all their business locations worldwide. AT&T is one of only two companies (the other being WorldCom) that can cover the full national and international telecommunications needs of business customers.

Fifth, since AT&T does not have to provide universal service, it can target only the most profitable customers, while Verizon MA must serve all customers, even those whose rates fail to cover the cost of providing service.

Sixth, AT&T is not required to share its network with competitors, whereas Verizon MA is compelled to share its network with competitors.

Q. What steps has AT&T taken to strengthen its position in the local exchange market in recent years?

A. AT&T has embarked on an aggressive acquisition program to strengthen its position in local exchange markets across the country. Within the last several years, AT&T has: (1) purchased Teleport Communications Group, the largest competitive local exchange carrier in the industry, for $12 billion; (2) purchased TCI, Inc., the second-largest multiple systems cable operator in the country, for $53 billion; (3) agreed to purchase MediaOne, the third largest multiple systems cable operator in the country, for $58 billion; (4) purchased IBM Global Services for $9 billion; (5) agreed to form a $10 billion global joint venture with British Telecom to provide global telecommunications services; and (6) agreed, along with British Telecom, to purchase 30 percent of Japan Telecom for $1.8 billion. These actions will give AT&T a tremendous boost in its efforts to provide a complete package of long distance, wireless, Internet access, data, and local exchange services to business and residential customers throughout the country, and, indeed, throughout the world.

Q. What are WorldCom's strategies for providing local exchange service in Massachusetts?

A. WorldCom has at least three strategies for providing local exchange service in Massachusetts. First, like AT&T, WorldCom currently provides local exchange service through its own wireline local exchange facilities. In Massachusetts, WorldCom currently operates a local exchange network with seven local exchange switches and at least 400 route miles of fiber connected to some 150 buildings.

Second, WorldCom is able to offer local exchange service throughout Massachusetts either by reselling Verizon MA's local exchange service or by leasing Verizon MA's unbundled network elements.

Third, WorldCom is able to offer local exchange service through its fixed wireless technologies. WorldCom, through its acquisition of CAI Wireless and its 38 percent stake in Metricom Inc., currently has licenses to provide MMDS service in Boston.

Q. Does WorldCom have any advantages in offering local exchange service in Massachusetts?

A. Yes. WorldCom has almost all the advantages of AT&T, including: (1) an established brand name; (2) a national and international network of telecommunications facilities; and (3) an ability to handle all of a customer's telecommunications services at every location worldwide. Many financial analysts consider WorldCom to be one of

the best-positioned global telecommunications services providers because its ownership of extensive international telecommunications facilities allows it to offer global telecommunications services at lower cost.

Q. What steps has WorldCom taken to strengthen its position in the local exchange market?

A. Like AT&T, WorldCom has used an aggressive series of acquisitions to strengthen its position in the local exchange market. Within the last several years, WorldCom has: (1) purchased MFS Communications, a leading facilities-based CLEC, and UUNET Technologies, the leading worldwide provider of Internet access, for $12 billion; (2) purchased MCI Communications, the second leading U.S. supplier of long distance services, for $40 billion; (3) purchased Brooks Fiber Properties, another leading CLEC, for $17 billion; and (4) purchased CAI Wireless for $482.8 million in cash. As a result of these acquisitions, WorldCom is now able to offer a package of local, long distance, data, and Internet access services to customers throughout the U.S. and Europe.

Q. Does Verizon MA face competition from other incumbent local exchange companies?

A. Yes. SBC has purchased Southern New England Telephone, which provides service in a neighboring state. SBC could easily expand its local service from Connecticut to Massachusetts. In addition, SBC has announced with respect to its merger with Ameritech that it would deliver fully competitive local exchange service in 30 new major metropolitan markets throughout the country, including the Boston metro area currently served by Verizon MA.

Q. Are investors primarily concerned with current or expected future competition when they assess the investment risk of Verizon MA?

A. Investors are primarily interested in expected future competition when they assess the current investment risk of Verizon MA because expected future competition is a primary determinant of volatility in the expected returns on their investment.

Q. Can Verizon MA's investment risk be measured by Verizon MA's current share of the local exchange market?

A. No. Remarkable as the growth of CLEC revenues and market share may be, current market share statistics are nonetheless a poor indicator of competitive risks in the local exchange market. An incumbent's current market share reflects its historical position as the franchised provider of local exchange services in its service territory. The privileged position of the incumbent as the franchised provider

has been eliminated. Investors' perception of risk depends on expected future competition, not current competition as reflected in market share.

Q. You noted previously that the cost of capital to be used in Verizon MA's cost studies must be based on the principle of forward-looking economic cost. Is the forward-looking economic cost principle consistent with the use of Verizon MA's current market share as an indicator of investment risk?

A. No. First, the forward-looking economic cost principle is economically relevant only in a competitive market for telecommunications services. Thus, the forward-looking economic cost principle, at its heart, is based on the assumption that the market for local exchange services is fully competitive.

Second, the forward-looking economic cost principle requires a consideration of the level of competition and investment risk over the entire future life of Verizon MA's investment in network facilities. Given the rapid changes in the telecommunications industry and the certainty that competition will increase, Verizon MA's current market share is a poor indicator of future competition and risk.

Q. Is Verizon MA able to compete on equal terms with competitors in the local exchange?